

## POSSIBLE REPRODUCTION OF THE COMAL SPRINGS RIFFLE BEETLE, *HETERELMIS COMALENSIS* (COLEOPTERA: ELMIDAE), IN CAPTIVITY<sup>1</sup>

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**ABSTRACT:** Endangered Comal Springs riffle beetles have been kept in captivity at the San Marcos National Fish Hatchery and Technology Center since 1996. In 2000, beetle larvae were found in an aquarium that previously had only adults. None of the larvae survived for more than 8 months. One adult beetle survived for 19 months.

**KEY WORDS:** *Heterelmis comalensis*, Coleoptera, Elmidae, Texas, reproduction.

The Comal Springs riffle beetle (*Heterelmis comalensis* Bosse, Tuff, and Brown) (Coleoptera: Elmidae) occurs in spring-runs of the Comal River (Comal Springs), New Braunfels, Comal County, Texas (Bosse *et al.* 1988), and a single specimen was found in the headwaters of the San Marcos River, Hays County, Texas, in 1992 (Barr 1993). The spring ecosystems of both rivers are dependent upon flow from the Edwards Aquifer which also provides high quality water to meet an ever-increasing human demand. *Heterelmis comalensis* was listed as endangered in 1998 by the U.S. Fish and Wildlife Service (1997), primarily because of threats to its habitat. Additionally, the U.S. Fish and Wildlife Service (1996) required the development of refugium populations for the listed species from the spring ecosystems of the San Marcos and Comal rivers.

Since July 1996, the San Marcos National Fish Hatchery and Technology Center (NFHTC), San Marcos, Texas, has been involved in refugium activities for *H. comalensis*. Beetles were collected from rocks in Comal Springs during 1996-1998 and brought to the NFHTC. They were identified as *Heterelmis* using Merritt and Cummins (1984) and were presumed to be *H. comalensis* since the only other similarly-sized elmids known from Comal Springs are *M. pusillus* (Arsuffi 1993; Barr 1993) and *Stenelmis* sp. (Bowles *et al.* 2000). Beetles were placed in flow-through (Edwards Aquifer water) aquaria with limestone rocks covered with algae from Comal Springs. Aquarium configuration was modified several times, changing flow pattern and rate, rock arrangement, and adding temperature-conditioned bio-filtered recirculated water. Although one beetle lived for 11 months, survival was poor and losses averaged about 24% per month.

In January 2000, 43 adult *H. comalensis* were collected at Comal Springs among leaf litter and rocks in the springs emerging from the edge of the spring-runs. Most of the beetles were aggregated on decaying leaves from anacua (*Ehretia anacua*), an endemic tree, and had attached protozoans which commonly are found on riffle beetles (Brown 1987). The beetles were placed in an acid-washed aquarium containing a mixture of flow-through water and recircu-

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lated water, anacua leaves that had been air-dried, and limestone rocks from a terrestrial source. The aquarium was fitted with a standpipe and small-mesh (about 0.5-mm) screening and was covered with tight-fitting plexiglass to exclude insects and other animals. In April 2000, five early instar larvae were found in this aquarium and removed to a covered, 600-ml plastic beaker for rearing to adulthood. The beaker was modified for flow-through of well water and contained anacua leaves and a limestone rock for substrate. All of these larvae died within 5 months.

In September 2000, 33 additional larvae were found, mostly on anacua leaves, in the aquarium with the adult beetles. One larva was confirmed as *Heterelmis* using Merritt and Cummins (1984) and was presumed to be *H. comalensis*, as were the remaining 32 larvae. The larvae were removed to the 600-ml flow-through beaker. By December 2000, only 18 of these larvae survived and by May 2001 all of the larvae had died. Survival of adult Comal Springs riffle beetles during this same 8-month period also was low (11%). However, three adult beetles lived in captivity for 17 months and one of these lived an additional 2 months. Brown (1973) noted that adults of *H. vulnerata* can live for several years and those of *M. pusillus* can live for at least 9 years in captivity. While it is possible that eggs or larvae were brought in from the wild and simply developed further in captivity, these life stages were never observed during collection. Thus, it is likely that either female beetles with fertilized eggs had been collected or fertilization and larval development took place in the aquarium. In either case, some level of early life stage development occurred in captivity. It is demonstrated here that adult specimens of *H. comalensis* can survive for at least 1 year, and possibly reproduce, in captivity.

Captive culture of the Comal Springs riffle beetle may become important for the short-term if spring-run habitat in the Comal River is degraded by loss of springflow or pollution. However, survival of *H. comalensis* can be assured only if springflow of high quality water is maintained.

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ADDENDUM—In February 2004, larvae (F2) produced from captive-bred adults (F1) were found, documenting completion of the Comal Springs riffle beetle's entire lifecycle in captivity.